ArevaEPRDCPEm Resource

From: Pederson Ronda M (AREVA NP INC) [Ronda.Pederson@areva.com]
Sent: Friday, May 08, 2009 5:24 PM
To: Getachew Tesfaye
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); OWEN Dennis E (EXT); PORTER Thomas (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 207, FSAR Ch. 16
Attachments: RAI 207 Response US EPR DC.pdf

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 207 Response US EPR DC.pdf" provides technically correct and complete responses to 4 of the 5 parts of the question.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 207 Question 16-292 parts 1, 2, 3, 5 and 6.

The following table indicates the respective pages in the response document, "RAI 207 Response US EPR DC.pdf," that contain AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 207 — 16-292 part 1	2	4
RAI 207 — 16-292 part 2	2	4
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RAI 207 — 16-292 part 4	2	4
RAI 207 — 16-292 part 5	2	4
RAI 207 — 16-292 part 6	2	4

A complete answer is not provided for the fourth part of the question. The schedule for a technically correct and complete response to the fourth part of the question is provided below.

Question #	Response Date
RAI 207 — 16-292 part 4	June 30, 2009

Sincerely,

Ronda Pederson
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Sent: Thursday, April 09, 2009 1:56 PM
To: ZZ-DL-A-USEPR-DL
Cc: Hien Le; Richard Laura; Peter Hearn; Joseph Colaccino; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 207 (2453), FSARCh. 16

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on March 27, 2009, and discussed with your staff on April 9, 2009. No changes were made to the Draft RAI Questions as a result of that discussion. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,
Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP
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Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 462

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RAI 207 Response US EPR DC.pdf	116919	

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Response to

Request for Additional Information No. 207 (2453), Revision 0

4/09/2009

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 16 - Technical Specifications
Application Section: TS 3.5

QUESTIONS for Technical Specification Branch (CTSB)

Question 16-292:

In the AREVA's response to RAI No. 142, Question 19-269, regarding the application of Criteria 4 of 10 CFR 50.36(c)(2)(ii) for selection of plant SSC to be included in a TS LCO, three additional LCO requirements were proposed in the EPR GTS Section 3.5 (3.5.6, 3.5.7 and 3.5.8), which establish OPERABLITY of the MHSI pumps and the IRWST in Modes 5 and 6. The following additional information is needed regarding the content of these newly proposed TS requirements:

1. TS 3.5.6, IRWST – Shutdown, MODE 5

   Regarding SR 3.5.6.1, justify not including verification of IRWST water temperature as specified in SR 3.5.4.1 or revise TS 3.5.6 and the associated bases B 3.5.6, as appropriate.

   In the proposed SR 3.5.6.1, the verification of IRWST water temperature in accordance with SR 3.5.4.1 was not included in the applicable SR list. The reason for the omission was not discussed in the response mentioned above. Further, one shutdown key assumption in EPR FSAR section 19.1.6.2.5 states "IRWST cooling is not required when the RPV head is off" which is applicable only for Mode 6.

   This information is being requested to ensure accuracy and completeness of SR 3.5.6.1.

2. TS 3.5.6, IRWST – Shutdown, MODE 5

   Explain how the described Required Action C.1 can successfully resolve the situation listed in Condition C. Revise TS 3.5.6 and the associated TS bases B 3.5.6, as appropriate.

   The action to restore IRWST to OPERABLE status was already found to be unsuccessful by the entry into Condition C which states "Required Action and associated Completion Time not met" for an earlier listed Condition A or B. Further, an action comparable to Required Action C.1 of TS 3.5.7 (e.g. Increasing RCS water inventory to a level consistent with other shutdown Mode TS in the EPR GTS) appears to be effective to counter the effect of losing safety injection flow paths.

   This information is being requested to ensure adequacy of Required Action C.1.

3. TS 3.5.8, ECCS – Shutdown, MODES 5 and 6

   Demonstrate the successful resolution of each of the situations listed in Condition B by the described Required Action B.1. Revise TS 3.5.8 and the associated TS bases B 3.5.8, as appropriate.

   Condition B should be for "Two inoperable MHSI pumps" only. Required Action B1 was automatically satisfied even when the Completion Time for Required Action A1 was expired.

   The "Required Action and associated Completion Time not met" should be placed separately in a new Condition C with its Required Action compatible with similar conditions established in TS 3.5.6 and TS 3.5.7.

   This information is being requested to ensure consistency and completeness of all related TS requirements in TS 3.5.6 through TS 3.5.8.

4. TS 3.5.8, ECCS – Shutdown, MODES 5 and 6

   Justify not proposing to add the "RCS Hot Leg Low Level" signal to the TS 3.3.1 for the EPR Protection System (PS) or revise the applicable TS and bases, as appropriate.

   The TS bases B 3.5.8, Applicable Safety Analyses section, Second paragraph states, in part, "MHIS is automatically actuated by the PS."

   Also, EPR FSAR section 19.1.6.1.7 states, in part, "SIAS - The safety injection signal is changed in the MHIS model to low delta P(sat) in POS CA and to low loop level in POS CB, POS D, and POS E." The “low delta P(sat)” signal that is used to auto start the MHIS pumps in Mode 4 is included in TS 3.3.1. Therefore, the “low loop level” signal that is used to auto start the MHIS pumps in Modes 5 and 6 should be included in the EPR GTS.

   This information is being requested to ensure consistency and completeness of TS requirements specified in TS 3.5.8 and other related TS in the EPR GTS.

5. TS 3.5.6, IRWST – Shutdown, MODE 5

   In the TS bases B 3.5.6, Applicable Safety Analyses section, the statement "The IRWST in MODE 5 is included pursuant to 10 CFR 50.36 (b)" should be revised to read "The IRWST in MODE 5 satisfies Criteria 4 of 10 CFR 50.36(c)(2)(ii)."

   This information is needed for consistency with the discussion provided in the AREVA's response mentioned above. This is applicable also to TS 3.5.7 and TS 3.5.8.

6. Correct the following editorial errors:

   Page B 3.5.7-1, Applicable Safety Analyses section, first sentence: Revise to read "For postulated shutdown events in MODE 6, RCS heat removal is provided by injection of borated water from the IRWST by Medium Head Safety Injection (MHSI)." This change is for consistency with the respective discussions in the bases for TS 3.5.4 and TS 3.5.6.

   Page B 3.5.8-2, Applicability section, third paragraph: Delete the first sentence. The second paragraph is being revised to cover Modes 5 and 6.

Response to Question 16-292:

1. As described in the U.S. EPR FSAR, Tier 2, Chapter 16 (Technical Specifications) Bases, Section 3.5.4 (Applicable Safety Analysis), the upper temperature limit for the in-containment refueling water storage tank (IRWST) comes from loss of coolant accident (LOCA) and containment analyses. The lower limit on IRWST temperature is consistent with the mechanical requirements of the reactor pressure vessel. Temperature limits of 122°F and 59°F apply during periods of normal plant operation (MODES 1 – 4), as noted in U.S. EPR FSAR, Tier 2, Chapter 6, Tables 6.2.1-4, 6.2.1-6, and 6.2.1-7 and Chapter 15, Section 15.6 and Tables 15.0-54 and 15.6-8. These limits are not applicable in MODE 5 since a LOCA is not a postulated event. Also, the reactor coolant system (RCS) is not under significant pressure so the lower temperature limit is not a consideration. Therefore, the MODE 1 – 4 temperature limits for the IRWST are not applicable in MODE 5. Temperature limits are not an input assumption for water supplied to the medium head safety injection (MHSI) pumps for mitigating a loss of decay heat removal event in MODE 5. Therefore, no

surveillance requirement is needed for the IRWST water temperature in U.S. EPR FSAR, Tier 2, Chapter 16 (Technical Specifications), Section 3.5.6. U.S. EPR FSAR, Tier 2, Chapter 19, Section 19.1.6.2.5 states: "IRWST cooling is not required when the RPV head is off." Therefore, U.S. EPR FSAR, Tier 2, Chapter 16 (Technical Specifications), Section 3.5.7 and Bases will be revised to limit the applicability to MODE 6 when the refueling cavity is not filled.

2. Action C.1 will be revised to require verification that the RCS pressure boundary is intact and the pressurizer level ≥ 25%.

3. U.S. EPR FSAR, Tier 2, Chapter 16 (Technical Specifications), Section 3.5.8 and Bases will be revised to move the "Required Action and associated Completion Time not met" into a separate Condition C.

4. A response to this part of the question will be provided by June 30, 2009.

5. U.S. EPR FSAR, Tier 2, Chapter 16 (Technical Specifications), Sections 3.5.6, 3.5.7, and 3.5.8 Bases will be revised to reference Criteria 4 of 10 CFR 50.36(c)(2)(ii).

6. The requested editorial changes to U.S. EPR FSAR, Tier 2, Chapter 16 (Technical Specifications), Sections 3.5.7 and 3.5.8 Bases will be made.

FSAR Impact:

U.S. EPR FSAR, Tier 2, Chapter 16, Sections 3.5.6, 3.5.7, and 3.5.8 and their associated Bases will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.6 In-Containment Refueling Water Storage Tank (IRWST) - Shutdown, MODE 5

LCO 3.5.6 The IRWST shall be OPERABLE.

APPLICABILITY: MODE 5.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. IRWST water volume, boron concentration, or enrichment not within limits.	A.1 Restore IRWST water volume, boron concentration, and enrichment to within limits.	8 hours
B. IRWST inoperable for reasons other than Condition A.	B.1 Restore IRWST to OPERABLE status.	1 hour
C. Required Action and associated Completion Time not met.	C.1 Initiate action to be in MODE 5 with the RCS pressure boundary intact and ≥25% pressurizer level~~restore IRWST to OPERABLE status~~. AND C.2 Suspend positive reactivity additions.	Immediately Immediately

16-292.1

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.7 In-Containment Refueling Water Storage Tank (IRWST) - Shutdown, MODE 6

LCO 3.5.7 The IRWST shall be OPERABLE.

16-292.1

APPLICABILITY: MODE 6 with the refueling cavity not filled.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. IRWST, refueling canal, and refueling cavity water volume not within limits.	A.1	Restore IRWST, refueling canal, and refueling cavity water volume to within limits.	8 hours
B. IRWST, refueling canal, and refueling cavity inoperable for reasons other than Condition A.	B.1	Restore IRWST, refueling canal, and refueling cavity to OPERABLE status.	1 hour
C. Required Action and associated Completion Time not met.	C.1	Initiate action to achieve refueling cavity water level ≥ 23 feet above the reactor vessel flange.	Immediately
	AND		
	C.2	Suspend positive reactivity additions.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.7.1	Verify IRWST, refueling canal, and refueling cavity borated water volume is ≥ 500,342 gallons.	24 hours

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.8 ECCS - Shutdown, MODES 5 and 6

LCO 3.5.8 Two Medium Head Safety Injection (MHSI) trains shall be OPERABLE.

APPLICABILITY: MODE 5 and 6.

ACTIONS

16-292.3

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required MHSI train inoperable.	A.1 Restore required MHSI train to OPERABLE status.	72 hours
B. Two required MHSI trains inoperable. ~~Required Action and associated Completion Time of Condition A not met.~~ ~~OR~~ ~~Two required MHSI trains inoperable.~~	B.1 Initiate action to restore at least one MHSI train to OPERABLE status.	Immediately
C. Required Action and associated Completion Time not met.	C.1 Initiate action to be in MODE 5 with the RCS pressure boundary intact and ≥25% pressurizer level. AND C.2 Suspend positive reactivity additions.	Immediately Immediately

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.6 In-Containment Refueling Water Storage Tank (IRWST) - Shutdown, MODE 5

BASES

BACKGROUND

A description of the IRWST is provided in LCO 3.5.4, “In-containment Refueling Water Storage Tank - Operating.”

APPLICABLE SAFETY ANALYSES

For postulated shutdown events in MODE 5 with the Reactor Coolant System (RCS) pressure boundary intact, the primary protection is the Medium Head Safety Injection (MHSI) trains, where the IRWST serves as the source of borated water. For events in MODE 5 with the RCS pressure boundary open, RCS heat removal is provided by MHSI injection of borated water from the IRWST.

No loss of coolant accidents (LOCAs) are postulated during plant operation in MODE 5. However, the IRWST is available to minimize the probability and consequence of an event to the extent possible.

16-292.5

The IRWST in MODE 5 ~~is included pursuant to~~satisfies Criteria 4 of 10 CFR 50.36 (c~~b~~)(2)(ii).

LCO

The IRWST requirements ensure that an adequate supply of borated water is available to supply the required volume of borated water as safety injection for cool cooling and reactivity control.

To be considered OPERABLE, the IRWST must meet the water volume, boron concentration and boron enrichment limits defined in the Surveillance Requirements.

APPLICABILITY

In MODE 5 with the RCS pressure boundary intact or with the RCS open, the IRWST is an RCS injection source of borated water for core cooling and reactivity control.

The requirements for the IRWST in MODES 1, 2, 3 and 4 are specified in LCO 3.5.4, In-containment Refueling Water Storage Tank (IRWST) - Operating. The requirements for the IRWST in MODE 6 are specified in LCO 3.5.7, In-containment Refueling Water Storage Tank (IRWST) - Shutdown, MODE 6.

BASES

ACTIONS

A.1

With IRWST water volume, boron concentration, or enrichment not within limits, it must be returned to within limits within 8 hours. Under these conditions the ECCS cannot perform its design function. Therefore, prompt action must be taken to restore the tank to OPERABLE condition. The 8 hour limit is acceptable considering that the IRWST will be fully capable of performing it's assumed safety function in response to DBAs with slight deviations in these parameters.

B.1

With the IRWST inoperable for reasons other than Condition A, it must be restored to OPERABLE status within 1 hour.

In this Condition, the ECCS cannot perform its design function. Therefore, prompt action must be taken to restore the tank to OPERABLE status or to place the plant in a condition in which the probability and consequences of an event are minimized to the extent possible. The short time limit of 1 hour to restore the IRWST to OPERABLE status is based on this condition simultaneously affecting redundant trains.

C.1 and C.2

16-292.2

If the IRWST cannot be returned to OPERABLE status within the associated Completion Time, the plant must be placed in a condition in which the probability and consequences of an event are minimized to the extent possible. This is done by immediately initiating action to place the plant in MODE 5 with the RCS intact with ≥ 25% pressurizer level. This provides adequate RCS inventory in support of RHR cooling~~restore the IRWST to OPERABLE status~~. Additionally, action to suspend positive reactivity additions is required to ensure that the SDM is maintained. Sources of positive reactivity addition include boron dilution, withdrawal of rod control cluster assemblies, and excessive cooling of the RCS.

SURVEILLANCE REQUIREMENTS

SR 3.5.6.1

The LCO 3.5.4 Surveillance Requirements and Frequencies (SR 3.5.4.2 through 3.5.4.4) are applicable to the IRWST in MODE 5. Refer to the corresponding Bases for LCO 3.5.4 for a discussion of each SR.

REFERENCES

None

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.7 In-Containment Refueling Water Storage Tank (IRWST) - Shutdown, MODE 6

BASES

BACKGROUND

A description of the IRWST is provided in LCO 3.5.4, “In-containment Refueling Water Storage Tank - Operating.”

16-292.6

APPLICABLE SAFETY ANALYSES

For postulated shutdown events in MODE 6, RCS heat removal is provided by injection of borated water from the IRWST by Medium Head Safety Injection (MHSI).

16-292.5

The IRWST in MODE 6 ~~is included pursuant to~~satisfies Criteria 4 of CFR 50.36 (c~~b~~)(2)(ii).

LCO

The IRWST requirements ensure that an adequate supply of borated water is available to supply the required volume of borated water as safety injection for cool cooling.

To be considered OPERABLE, the IRWST in combination with the refueling canal must meet the water volume limits defined in the Surveillance Requirement. Any canal leakage should be estimated and made up with borated water such that the volume in the IRWST plus the refueling canal and refueling cavity will meet the IRWST volume requirement.

Boron concentration requirements are addressed by LCO 3.9.1

APPLICABILITY

16-292.1

In MODE 6, the IRWST is the MHSI injection source of borated water for core cooling. Once the refueling cavity is filled, the IRWST is no longer required as an injection source.

The requirements for the IRWST in MODES 1, 2, 3, and 4 are specified in LCO 3.5.4, In-containment Refueling Water Storage Tank (IRWST) - Operating. The requirements for the IRWST in MODE 5 are specified in LCO 3.5.6, In-containment Refueling Water Storage Tank (IRWST) - Shutdown, MODE 5.

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.8 ECCS - Shutdown, MODES 5 and 6

BASES

BACKGROUND

The Background section for Bases 3.5.2, "ECCS - Operating," is applicable to these Bases, with the following modifications.

In MODES 5 and 6, a single ECCS train consisting of a Medium Head Safety Injection (MHSI) train is capable of providing the core cooling function. Low head Safety Injection is not automatically actuated.

The ECCS flow paths consist of piping, valves, heat exchangers, and pumps such that water from the in-containment refueling water storage tank (IRWST) can be injected into the Reactor Coolant System (RCS) following loss of shutdown cooling event.

APPLICABLE SAFETY ANALYSES

The Applicable Safety Analyses section of Bases 3.5.2 also applies to this Bases section.

Due to the stable conditions and low RCS pressure associated with operation in MODES 5 and 6 and the reduced probability of occurrence of a shutdown event, the ECCS operational requirements are reduced. Below P14 and RHR connected, LHSI is not automatically actuated by the Protection System (PS). However, MHSI is automatically actuated by the PS.

Two trains of ECCS are required for MODES 5 and 6. Protection against single failures is provided for this MODE of operation.

16-292.5

The ECCS trains in MODES 5 and 6 ~~are included pursuant to~~satisfies Criteria 4 of 10 CFR 50.36(c~~b~~)(2)(ii).

LCO

In MODES 5 and 6, two of the four independent (and redundant) ECCS MHSI trains are required to be OPERABLE to ensure that sufficient ECCS flow is available to the core following shutdown events. One train is required to accomplish the safety function and one train is assumed lost to a single failure. The ECCS cross-connects are not needed for events postulated in MODES 5 and 6.

In MODES 5 and 6, an ECCS train consists of an MHSI subsystem. Each train includes the piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the IRWST.

BASES

LCO (continued)

During an event requiring ECCS MHSI actuation, a flow path is required to provide an abundant supply of water from the IRWST to the RCS via the ECCS pumps and to its associated four cold leg injection nozzles. In the long term, this flow path may be switched to deliver its flow to the RCS hot and cold legs.

APPLICABILITY

In MODES 1, 2, and 3, the OPERABILITY requirements for ECCS are covered by LCO 3.5.2. MODE 4 OPERABILITY is covered by LCO 3.5.3.

In MODES 5 and 6, two OPERABLE ECCS MHSI trains are acceptable and provide for single failure consideration on the basis of the stable reactivity of the reactor and the limited core cooling requirements.

16-292.6

~~In MODES 5 and 6, plant conditions are such that the probability of an event requiring ECCS injection is extremely low.~~ Core cooling requirements in MODE 5 are addressed by LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled," and LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled." MODE 6 core cooling requirements are addressed by LCO 3.9.4, "LHSI/RHR and Coolant Circulation - High Water Level," and LCO 3.9.5, "LHSI/RHR and Coolant Circulation - Low Water Level."

ACTIONS

A.1

With one required MHSI train inoperable, the inoperable train must be returned to OPERABLE status within 72 hours. The 72 hour Completion Time is based on an NRC reliability evaluation (Ref. 5) and is a reasonable time for repair of many ECCS components.

An ECCS train is inoperable if it is not capable of delivering design flow to the RCS. Individual components are inoperable if they are not capable of performing their design function or supporting systems are not available.

16-292.3

B.1

~~When Required Action A.1 cannot be completed within the required Completion Time; or if~~ If two required ECCS MHSI trains are inoperable, immediate action must be taken to restore at least one MHSI train to OPERABLE status.

BASES

ACTIONS (continued)

16-292.3

C.1 and C.2

If any Required Action and associated Completion Time cannot be met, the plant must be placed in a condition in which the probability and consequences of an event are minimized to the extent possible. This is done by immediately initiating action to place the plant in MODE 5 with the RCS intact with ≥ 25 % pressurizer level. This provides adequate RCS inventory in support of RHR cooling. Additionally, action to suspend positive reactivity additions is required to ensure that the SDM is maintained. Sources of positive reactivity addition include boron dilution, withdrawal of rod cluster control assemblies, and excessive cooling of the RCS.

SURVEILLANCE REQUIREMENTS

SR 3.5.8.1

The applicable Surveillance descriptions from Bases 3.5.2 apply.

REFERENCES

The applicable references from Bases 3.5.2 apply.